REMARKS/ARGUMENTS

The claims are 1-33, which have been amended to improve their form. Reconsideration is expressly requested.

Claims 1-33 were objected to because of certain informalities set forth on page 2 of the Office Action and also under 35 U.S.C. 112, second paragraph, as being indefinite for the reasons set forth on page 3 of the Office Action. In response, Applicants have amended claims 1-33 to improve their form. It is respectfully submitted that the foregoing amendments overcome the Examiner's objection to the claims and the rejection under 35 U.S.C. 112, second paragraph, as being indefinite, and Applicants' respectfully request that the rejection and objections on these bases be withdrawn.

Claims 1-33 were rejected under 35 U.S.C. 102(b) or (e) as being anticipated by the *Kopetz et al.*, "Coupling of Optoelectronic modules to optical layer in printed circuit boards (PCBs)."

This rejection is respectfully traversed.

As set forth in claim 1 as amended, claim 29 as amended, and claims 30-33 as amended, Applicants' invention provides a method for the production of an electro-optical printed circuit board having a number of layers with electrically conductive elements and at least one optical layer with optically conductive elements, an electro-optical printed circuit board produced according to that method, and the use of that electro-optical printed circuit board.

The at least one optical layer has a polysiloxane material, and structuring of the elements in a form of channel waveguides of the optical layer takes place by means of casting into a casting mold that contains the waveguide structures as a negative mold. A mechanical connection between the optical layer and at least one layer of the electrically conductive printed circuit board layers is produced in direct connection with the production of the optical layer.

In this way, Applicants' invention provides a method for the production of low-attenuation and highly temperature-stable optical layers that are suitable for a process-capable integration into printed circuit boards, printed circuit boards produced thereby, and the use of such printed circuit boards.

Kopetz et al. fails to disclose or suggest a method, circuit board or use in which polysiloxane is used in the production of an optical layer. *Kopetz et al.* simple mentions in general a liquid core polymer, not specified in any greater detail, which is filled into depressions in a foil. See page 2 of *Kopetz et al.*

The depressions themselves in *Kopetz et al.* are embossed by means of hot embossing from a foil (polymer foil), and are therefore produced in a manner completely different from Applicants' method as recited in claim 1 as amended. Moreover, covering of the waveguide core (core polymer) with the substrate layer (polymer foil = substrate) and of the superstrate layer (superstrate foil) takes place by means of using the embossed polymer foil as a substrate, and a superstrate layer, also configured as a foil, which is subsequently laid onto the cast core layer as finished layers. Cross-linking of these layers therefore already takes place previously, during production of the foils, and not during the production process of the optical layer.

Thus, although in *Kopetz et al.* a core polymer may be actually cast from three optically active partial layers, nevertheless, there is no disclosure or suggestion of using polysiloxane material

for this layer or for any other layer. Moreover, the two covering, optically active layers of *Kopetz et al.* are merely glued onto the cast layer as previously cross-linked foils. The high temperature stress on the materials used, which makes the use of special materials necessary and also can impair the optical properties of these materials, is particularly disadvantageous in *Kopetz et al.'s* method of procedure. This temperature stress is completely eliminated with Applicants' method as recited in claim 1 as amended.

Thus, Applicants' method as recited in claim 1 as amended, in which all the partial layers of the optically active layer are produced by means of casting, which also does not take place at elevated temperatures, further distinguishes Applicants' method as recited in claim 1 as amended from *Kopetz et al.*, along with the use of polysiloxane, which as mentioned above, is nowhere disclosed or suggested. Accordingly, it is respectfully submitted that *Kopetz et al.* fails to anticipate Applicants' method as recited in amended claims 1, 29, or 30-33 or in any of the dependent claims.

Claims 29-33 were rejected under 35 U.S.C. 102(b) as being anticipated by *Kaneko et al. U.S. Patent No. 6,088,492.* Claims 1-

33 were also rejected under 35 U.S.C. 103(a) as being unpatentable over *Kaneko et al.* in view of *Ouchi U.S. Patent Application Publication No. 2003/01779979* and *De Dobbelaere et al. U.S. Patent No. 5,764,820.*

Essentially the Examiner's position was (1) that *Koneko et al.* teaches the method recited in the claims, except for the means for fabricating the optical elements using casting into a casting mold that contains the waveguide structures as a negative mold, (2) that *Ouchi* teaches forming integrated electro-optical devices containing polysiloxane type materials for the optical layers, (3) that *Ouchi* and *De Dobbelaere et al.* teach that the formation of polymer waveguide layers such as polysiloxanes can be done by a number of manufacturing processes such as by molding and injection molding, and (4) that it would have been obvious to one of ordinary skill of the art at the time the invention was made to form the waveguide layer of *Koneko et al.* by a casting process of using a casting mold that contains the waveguide structure in a negative mold for the purpose of improving optical coupling in the eventual electro-optical printed circuit board, in that the polysiloxane waveguide layer can be made in a more efficient and repeatable manner.

This rejection is respectfully traversed.

None of the cited references discloses or suggests a method for the production of an electro-optical printer circuit board, an electro-optical printer circuit board produced thereby, and use of such electro-optical printer circuit board in which at least one optical layer has a polysiloxane material and structuring of the elements in the form of channel waveguides of the optical layer takes place by means of casting into a casting mold that contains a waveguide structure as a negative mold.

The primary reference to *Koneko et al.* simply concerns the use of siloxane material for the formation of an optical layer in a process that otherwise, it is respectfully submitted, contains clear differences from Applicants' method as recited in claim 1 as amended. There is no disclosure or suggestion of having structuring of the elements in a form of channel waveguides of the optical layer taking place by means of casting into a casting mold that contains the waveguide structures as a negative mold.

The secondary reference to *Ouchi* relates to an optical

waveguide apparatus and method for making the same in which the structure of the optical layer and also the structure of the circuit board is very different. Moreover, *Ouchie* fails to disclose or suggest the formation of the waveguides as structures cast into depressions. Instead, at the locations cited by the Examiner, *Ouchie* describes casting methods in only a very general manner and only as one of different possibilities ("dipping, castings, spin-coating or the like" in paragraph [15]), without giving any information concerning the method of procedure in connection with casting.

As can be seen in FIG. 4F, for example, *Ouchi* does not use casting of liquid materials into corresponding mold depressions, but rather surface casting over elevated structures that lead to a thick planar and unstructured layer, as is also described in detail in the Abstract of *Ouchi*. Guidance of light within this unstructured cast layer takes place by means of corresponding mirrors that direct the light, as can be seen in the drawings of *Ouchi*. There is no disclosure or suggestion of structured waveguides and, in fact, structured waveguides are neither described nor needed by *Ouchi*.

Like *Ouchi*, only a very general reference to casting techniques is made in the *De Dobbelaere et al.* secondary reference. A close analysis of *De Dobbelaere et al.*, moreover, shows that only unstructured casting of a planar layer and subsequent reworking by means of mechanical or chemical methods are discussed. In this connection, polysiloxane is not explicitly mentioned as a material that can be used, at the location indicated by the Examiner in *De Dobbelaere et al.*, but rather only "thermosetting polymeric material" is mentioned. Furthermore, column 5, lines 4-24 of *De Dobbelaere et al.* states that only partial regions of the optical layer are intended to guide light, but at the same time, a number of mechanical, chemical, or physical methods are mentioned, with which the regions not required to guide light can be worked out of the previously planar layer; however, it is respectfully submitted that a person skilled in the art cannot derive any information other than the general term "molding" from *De Dobbelaere et al.*, with regard to the form of the optical layer produced by means of casting. In this connection, moreover, casting of the planar layer, not casting of only partial regions of the layer into corresponding depressions, is clearly meant.

The preferred method for subsequent optical influencing of the polymer layer appears to be the so-called bleaching method described at column 7, lines 40 ff. of *De Dobbelaere et al.* In a uniformly produced layer, the index of refraction of the optical material is changed by means of laser effect, if necessary, and in this way, a certain amount of optical structuring is achieved. The optical layer itself, however, is cast as a plate, for example, in unstructured manner; however, it would not even be possible to produce such an unstructured layer with polysiloxane and to structure it subsequently by means of laser beams. The polysiloxane no longer changes its structure after it has hardened, and therefore cannot be structured in the manner described by *De Dobbelaere et al.*

Thus, neither *Kaneko et al.* together with *Ouchi* nor *Kaneko et al.* together with *De Dobbelaere et al.* or the combination of all three references gives a person skilled in the art any indication not to use a cohesive optical layer that is cast in one piece, but rather one in which only the corresponding light-guiding regions are cast into pre-formed depressions. Accordingly, it is respectfully submitted that claim 1 as amended, together with claims 2-33 which depend directly or indirectly thereon, are

patentable over the cited references.

In summary, claims 1-33 have been amended, In view of the foregoing it is respectfully requested that the claims be allowed and that this application be passed to issue.

Respectfully submitted,
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Enclosure: Copy of Petition for two-month Extension of Time

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 23, 2008.

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